IOWATER

Volunteer Water Quality Monitoring

Benthic Macroinvertebrate Key

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Key to Phylum/Classes of Benthic Macroinvertebrates

Nearly all of the **benthic macroinvertebrates** collected will fall into six major groups that are fairly easy to identify. They are:

1. **Flatworms (Planarians) –** Small, flat, soft-bodied worms which often have a triangular or arrowhead-shaped head. As a group, these are called **Tubellaria** (Figure A).

2. **Segmented Worms –** This **phylum** includes aquatic worms (**Oligochaeta**, Figure B) and leeches (**Hirudinea,** Figure C). Some oligochaetes look like small earthworms you might find in your garden, although usually they will be smaller, thinner, and more delicate. Leeches are larger, flattened, and usually have a **suction pad** on at least one end of their body.

3. **Mollusks –** This phylum includes **snails** and **clams/mussels**. Clams and mussels (Figure D) belong to the **class** Pelecypoda. Snails belong to the class Gastropoda. The most common snail **family** in Iowa is **Physidae (left spiral snail,** Figure E), pollution tolerant organisms that are identified by thier opening spiraling up from the left if you look at the shell with the tip pointed up. A more pollution sensitive group is the **right spiral snail** (Figure F), which are identified by their opening spiraling up from the right if you look at the shell with the tip pointed up. Two organisms in the somewhat pollution tolerant group from the Gastopoda class include **limpets** (a single uncoiled shell, Figure G) and **orbsnails** (a single coiled shell resembling the horns of a ram, Figure H).

4. **Crustaceans** – All of these organisms have more than six legs, two pairs of **antennae**, and an **exoskeleton** composed of **chitin.** This combination of characteristics separates crustaceans from other groups. The **classes** of this phylum that IOWATER identifies are:
   - *Crayfish* (**Decapoda**) look like small lobsters and have ten legs, with the front two bearing large **claws** (Figure I).
   - *Scuds* (**Amphipoda**) are **laterally compressed** (body is higher than it is wide), white to pale yellow in color, and good swimmers. They are also called "freshwater shrimp" (although there is no relation); scuds will be on their sides if taken out of the water because of their body shape (Figure J).
   - *Sowbugs* (**Isopoda**) look similar to scuds except they are flat (body is wider than it is high) and gray to brown in color (Figure K).

5. **Arachinds -** The water mite is the member of this class you may collect. They have 8 legs, no antenna, and a round one segment body (Figure L).

6. **Insects –** Most of the organisms you collect in this class will be the **immature larval** or **nymph stages** of insects. Many have three pairs of **"true" legs,** and those without legs will usually have fleshy bumps called **prolegs**. These aquatic insects will need to be identified to the **order** or family level for IOWATER Benthic Macroinvertebrate Indexing. If the organism that you are identifying does not fit in one of the aforementioned categories, please proceed to page 3.

*Note – Additional help in identifying Benthic Macroinvertebrates can be found in the identification key Guide to Aquatic Invertebrates of the Upper Midwest by R.W. Bouchard, Jr. It is recommended that you use the IOWATER Benthic Macroinvertebrate Key first and the Upper Midwest guide only when additional help is needed.

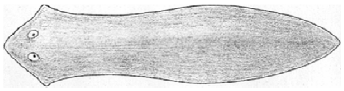

Figure A. Tubellaria (flatworm & planarian)

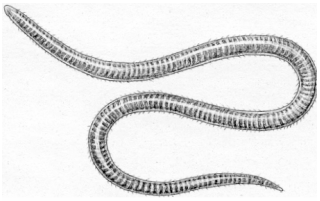

Figure B. Oligochaeta (aquatic worm)

Figure C. Hirudinea (leech)

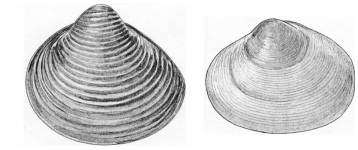

Figure D. Pelecypoda (clams and mussels)

Figure E. Physidae (left spiral snail)

Figure F. Right spiral snail

Figure G. Ancylidae (limpet)

Figure H. Planorbidae (orbsnail)

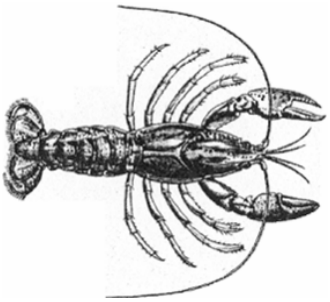

Figure I. Decopoda (crayfish)

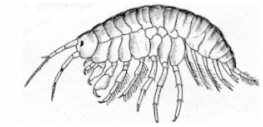

Figure J. Amphipoda (scud)

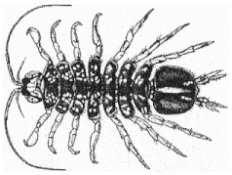

Figure K. Isopoda (sowbug)

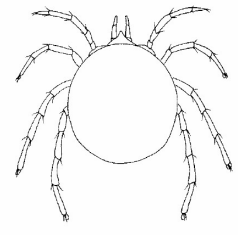

Figure L. Arachind (water mite)

Key to Orders of Aquatic Insects

*Note – Some beetle larvae will not **key out** directly using this key. They may key out as a Trichoptera or Megaloptera but then will not key out as a family. If you find yourself in this situation, compare with the examples in Figure 7 and/or on page 21 and 22.

1. **Thorax** without **segmented legs**, but may have prolegs (**unsegmented**) on one or more segments (Figure 1)……...….Diptera larvae (*true fly*) Page 5

   Thorax with segmented legs……...……...…….Go to 2

2. **Beetle**-like, with rounded or oval body, **abdominal segments** not visible when viewed from above (Figures 2-4) OR long, slender body, very long legs (Figure 5)….....….Go to 3

   Not as above……...…..Go to 4

3. Beetle-like, with hard, dark, often shell-like covering with a dividing line down center of back (Figure 2)……...…Coleoptera adult (*beetle*) Page 19-20

   Patterned or leathery textured back without a center dividing line (Figures 3-4) OR long, slender body with very long legs (Figure 5) ……..…..Hemiptera adult (*true bug*) Page 7

4. End of **abdomen** has 2-3 long, thin, **filament**-like "tails", not paddle-like……..…...…Go to 5

   "Tails" are absent, very short, spiny, thickened, or paddle-like……...…Go to 6

5. Sides of abdomen have plate-like, feather-like, or leaf-like **gills**, usually has three tail filaments……...…….Ephemeroptera larvae (*mayfly*) Page 8-10

   No gills on abdomen, or only on the first few abdominal segments closest to thorax, always has two tail filaments ……...……Plecoptera larvae (*stonefly*) Page 11-12

6. "Face" covered by mask that is actually an elbowed, extendable grasping organ that is part of the mouth ……...Odonata larvae (*dragonfly & damselfly*) Page 13

   Face has chewing mouthparts not like above……...……Go to 7

7. Abdominal segments have long, **lateral filaments** ……...…… ……..…...Megaloptera larvae (*alderfly & dobsonfly*) Page 14

   Not as above, although fine, thin filaments may be visible……..……....Go to 8

8. Abdomen fleshy……....……....Trichoptera larvae (*caddisfly*) Page 15-17

   Abdomen hardened and usually darkened (Figure 6)…..Coleoptera larvae (*beetle*) Page 21-22

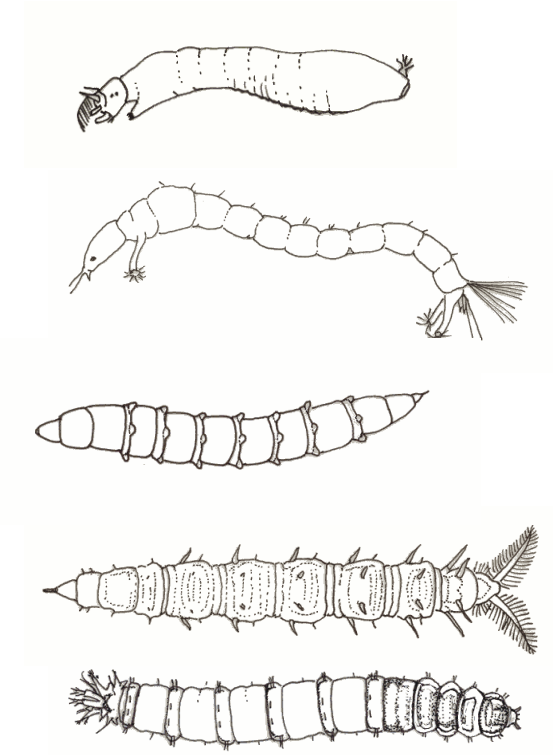

Figure 1. Diptera larvae (aquatic fly)

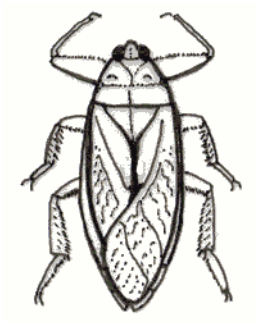

Figure 4. Hemiptera adult (true bugs)

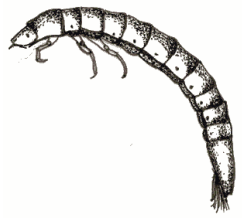

Figure 6. Coleoptera larvae (beetle)

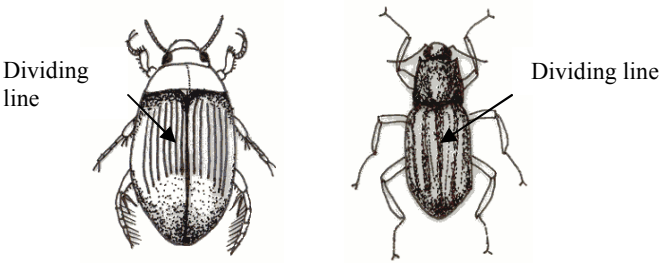

Figure 2. Coleoptera adults (beetle)

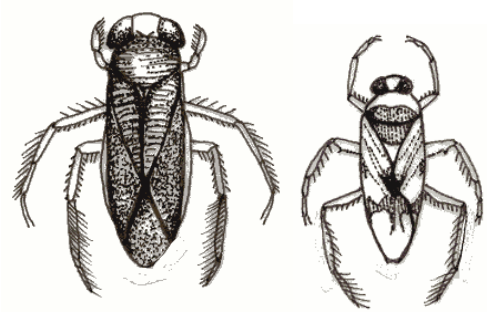

Figure 3. Hemiptera adults (true bugs)

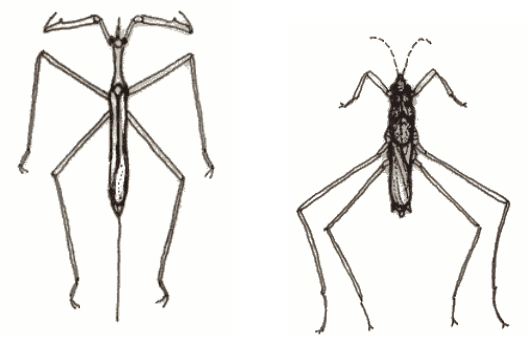

Figure 5. Hemiptera adults (true bugs)

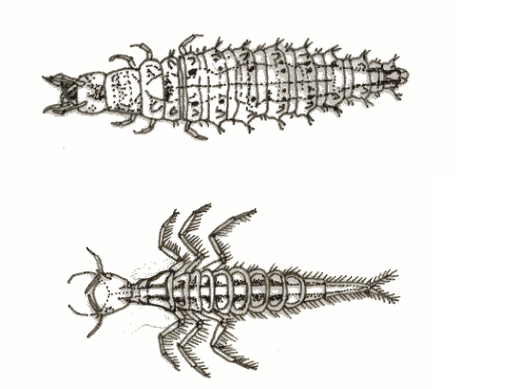

Figure 7. Coleoptera larvae (beetle)

Key to the Families of Diptera (True Flies)

1. **Head capsule** hardened and fully visible (Figures 8-9)……..……...…...…...Go to 2

   Head capsule absent or retracted (at least partially) into thorax……..….Go to 3

2. Prolegs only present on front of thorax, end of abdomen swollen and has a **sucker** (Figure 8).. ……..……..**Simuliidae** (*black fly*)

   Prolegs present on front of thorax and usually at end of abdomen, which is not swollen and has no suction cup (Figure 9)…….. ……**Chironomidae** (*midge fly*)

3. No head capsule (Figure 10-13)……...……..…… .Go to 4

   Head capsule rounded and apparently pulled into thorax, end of abdomen usually has two or more **fleshy lobes** (Figure 14-15)…...…… …….....**Tipulidae** (*crane fly*)

4. Long, thin **breathing tube** at least half as long as body extending from the abdomen, fleshy body (Figure 10)…….…… …...… **Syrphidae** (*rat-tailed maggot*)

   Not as above……...……..…….……...…Go to 5

5. Body tapered at both ends, a ring of **"pseudopods"** is present on each segment (Figure 11)… ……..… …**Tabanidae** (*horse fly*)

   Body ending in lobes or extensions and has prolegs on each segment ….....Go to 6

6. End of body has two extensions that appear "hairy" and are longer than prolegs (Figure 12)… ……..…….**Athericidae** (*crane fly*)

   End of body has "non-hairy" extensions and are usually shorter than prolegs (Figure 13)……. ……....……..…**Empididae** (*crane fly*)

Order Diptera

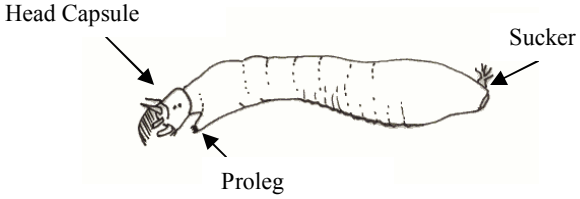

Figure 8. Family Simuliidae

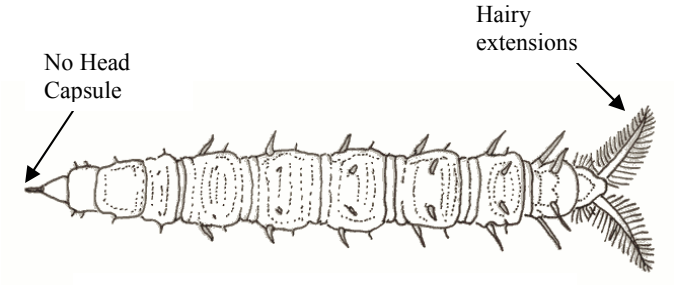

Figure 12. Family Athericidae

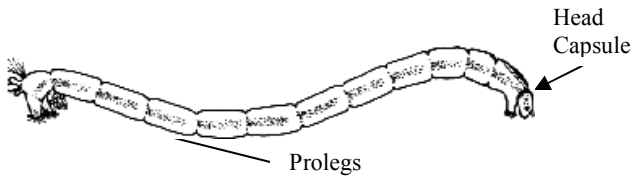

Figure 9. Family Chironomidae

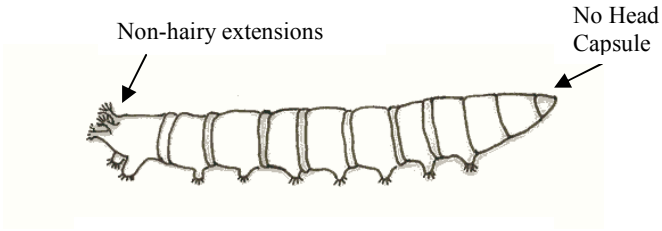

Figure 13. Family Empididae

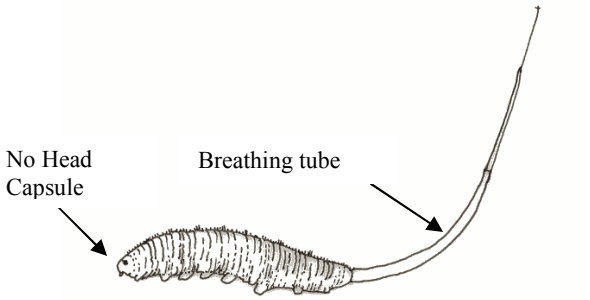

Figure 10. Family Syrphidae

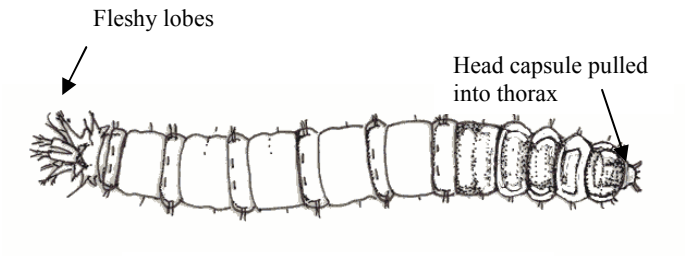

Figure 14. Family Tipulidae

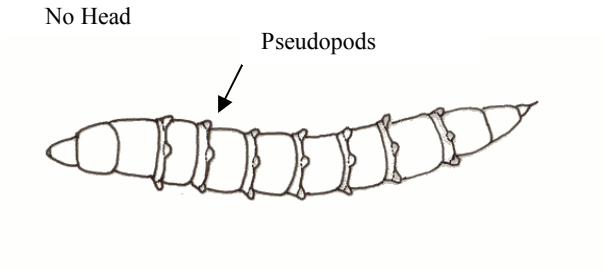

Figure 11. Family Tabanidae

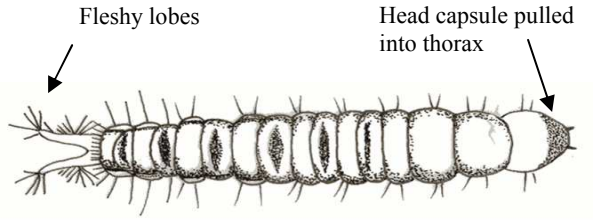

Figure 15. Family Tipulidae

Key to the Families of Hemiptera (true bugs)

1. End of abdomen has long, slender breathing tube (Figure 16).....**Nepidae** (*water scorpion)*

   Not as above……..……..…..Go to 2

2. Long and slender body and legs, "walks" on water surface, commonly called water striders (Figure 17) …...……..……...…**Gerridae** or **Veliidae** (*water strider*)

   Oval-shaped body with a patterned or leathery textured back (Figures 18 & 20)…….....Go to 3

3. Usually large body (>¾ inch), back is brown and leathery, raptor-like fore legs, swimming hairs on 3 sets of legs (Figure 18) …….....**Belostomatidae** (*giant water bug*)

   Smaller body (under ½ inch), back patterned and not leathery……..…..Go to 4

4. Front legs short with front foot forming a scoop, (Figure 19).……**Corixidae** (*water boatman*)

   Front legs not as shortened as above, family swims upside-down (Figure 20)……....
   ……..**Notonectidae** (*backswimmer*)

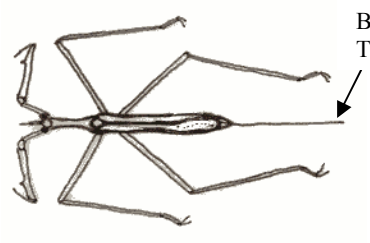

Figure 16. Family Nepidae

Figure 17. Family Gerridae or Veliidae

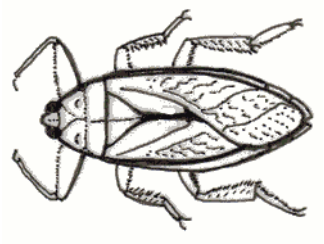

Figure 18. Family Belostomatidae

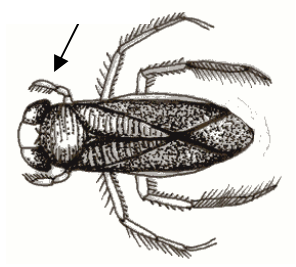

Figure 19. Family Corixidae

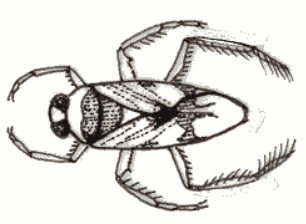

Figure 20. Family Notonectidae

Key to the Families of Ephemeroptera (Mayflies)

1. The top of the thorax is enlarged to form a shield which may or may not have **spines** (Figure 21)…….……...…….**Baetiscidae** (*armored mayfly*)

   Not as above……..…….……Go to 2

2. Gills on middle abdominal segments **forked and fringed** (Figure 22), head has **tusks** visible from above (Figures 23-24)……....Go to 3

   Various types of abdominal gills (if forked, not fringed – Figure 25), head without tusks ……..…….……..Go to 5 (Page 9)

3. **Foreleg** of front legs stout, sometimes with "bumps", for burrowing (Figure 23)…Go to 4

   Foreleg of front legs normal size (Figure 2)…...….....**Potamanthidae** (*Hacklegill mayfly*)

4. Tusks when viewed from the side curve upward (Figure 26)…… ……**Ephemeridae** (*burrowing mayfly*)

   Tusks when viewed from the side don't curve upward (Figure 27)……... ……**Polymitarcyidae** (*burrowing mayfly*)

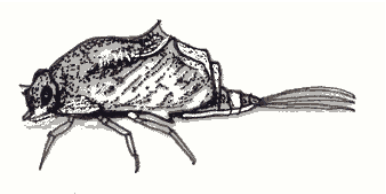

Figure 21. Family Baetiscidae

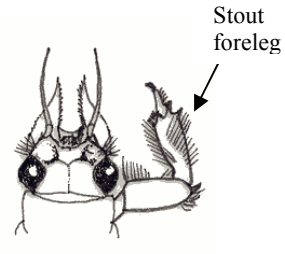

Figure 23. Forelegs for Burrowing

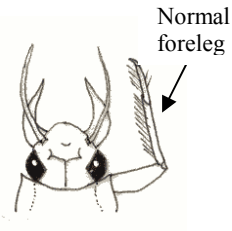

Figure 24. Normal forelegs

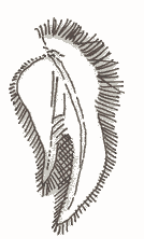

Figure 22. Gills forked and fringed

Figure 25. Gills forked but not fringed

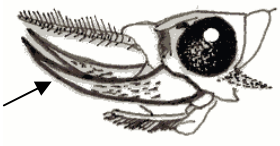

Figure 26. Tusks curved upward, Family Ephemeridae

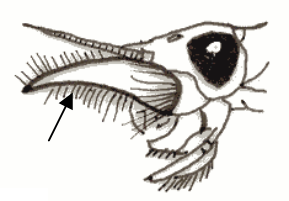

Figure 27. Tusks not curved upward, Familiy Polymitarcyiidae

5. Long, slender hairs on insides of front legs (Figure 28)…….……..……...……Go to 6

   Not as above……..…..……..Go to 7

6. Gills on first abdominal segment on top of segment and similar to other abdominal gills, body "**minnow-like**" (Figure 29)…… ……...…**Isonychiidae** (*minnow mayfly*)

   Gills on first abdominal segment on bottom of segment, this family is very rarely collected (Figure 28)……...…..…….**Oligoneuriidae** (*brush-legged mayfly*)

7. Gills on second abdominal segment form a cover or at least a partial cover for other segments' gills (Figure 30-31) ……..…...…….…….....Go to 8

   Gills on second abdominal segment not as above, like the other gills or absent……..…Go to 9

8. Gills on second abdominal segment triangular or oval, not meeting in middle of segment (Figure 30)…….....…**Leptohyphidae** (*mayfly*)

   Gills on second abdominal segment square or rectangular, meeting in middle of segment (Figure 31)…….……..**Caenidae** (*square-gilled mayfly*)

9. Gills absent or severely reduced on first and second abdominal segment (Figures 32-33) ……..**Ephemerellidae** (*spiny mayfly*)

   Gills present on first and/or second abdominal segments……..……Go to 10

10. Body and head very flattened, eyes on topside of head (Figure 34)…… ……**Heptageniidae** (*flathead mayfly*)

    Body and head not flattened, eyes on side or front of head…….……...Go to 11

11. **Tarsal claws** of front legs forked, very rarely collected (Figure 35)……... …….....**Metretopodidae**(*minnow mayfly*)

    Not as above……...……....Go to 12

12. Gills on middle abdominal segments are forked or **filamentous** as in Figures 25 or 37……. ……....**Leptophlebiidae**

    Gills not as above, usually oval or heart-shaped (Figure 36)…….. **Baetidae** (*minnow mayfly*)

Order Ephemeroptera

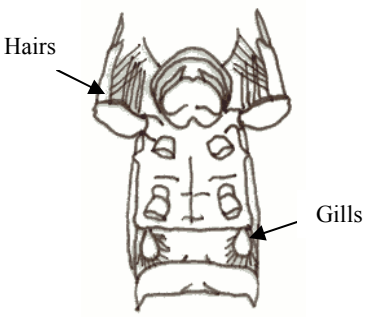

Figure 28. Hair on inside of legs, gills on first abdominal segment

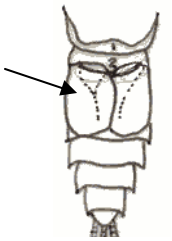

Figure 31. Gills meeting in center, Family Caenidae

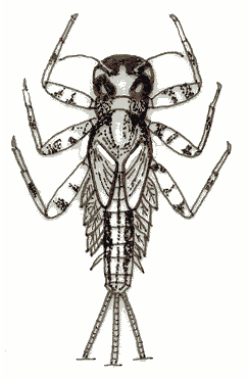

Figure 34. Flattened head and body of Family Heptageniidae

Figure 29. Minnow-like body of Family Isonychiidae

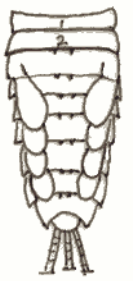

Figure 32. Gills absent on first and second abdominal segment, Family Ephemerellidae

Figure 35. Forked Tarsal claw on front leg of Family Metretopodidae

Figure 30. First gills forming a cover of other gills, not meeting in center, Family Leptohyphidae

Figure 33. Gills absent on first and second abdominal segment, Family Ephemerellidae

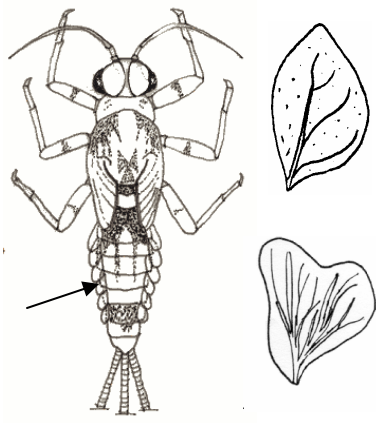

Figure 36. Oval or heart shaped gills of Family Baetidae

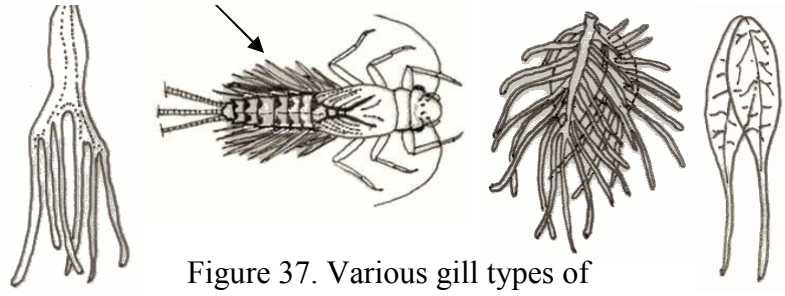

Figure 37. Various gill types of Family Leptophlebiidae

Key to the Families of Plecoptera (Stoneflies)

1. **Tufts** of gills on thorax around base of legs (Figure 38)…….....…….Go to 3

   No gills, single or forked gills on thorax around base of legs (Figure 39)…….....…..Go to 2

2. Thorax much wider than abdomen and robust (Figure 40) OR if present the **wing pads** (underdeveloped wings) are **divergent** (slightly forked) (Figure 42)……..……Go to 4

   Thorax slender only slightly wider than abdomen and rounded (Figure 41) OR if present the wing pads are parallel to the body (Figure 43), found in winter months …… ……**Capniidae** (*winter stonefly*)

3. Gill tufts present on thorax segments only (Figure 44)…… …… **Perlidae** (*stonefly*)

   Gill tufts present on thorax segments and the first and second abdominal segments (Figure 45).……..…..**Pteronarcyidae** (*giant stonefly*)

4. Head and abdomen have distinctive color patterns (Figure 46)....**Perlodidae** (*pattern stonefly*)

   Not as above…….…….……..Go to 5

5. Found in winter and early spring in "warm water streams," some have pale strip down the middle of the thorax and the abdomen (Figure 47) ……....**Taeniopterygidae** (*winter stonefly*)

   Found in spring and summer in "cold water streams," and spring runs, no pale strip down the middle of the thorax and the abdomen (Figure 48) ……....**Nemouridae** (*brown stonefly*)

Order Plecoptera

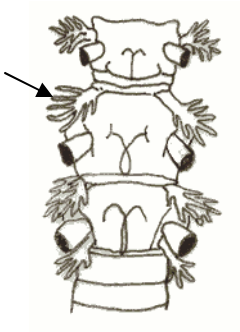

Figure 38. Tufts of gills on thorax around base of legs

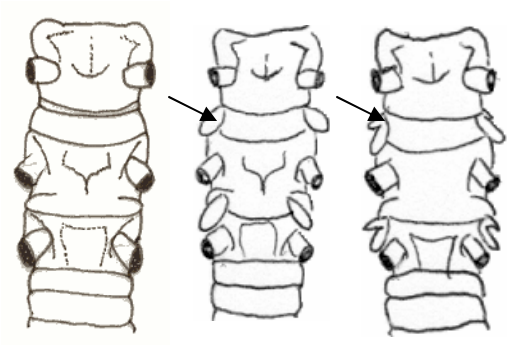

Figure 39. No gills, single or forked gills on thorax around base of legs

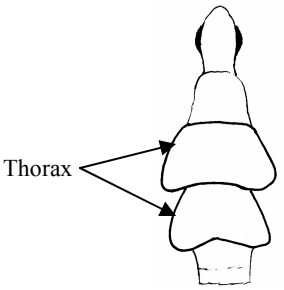

Figure 40. Thorax wider than abdomen

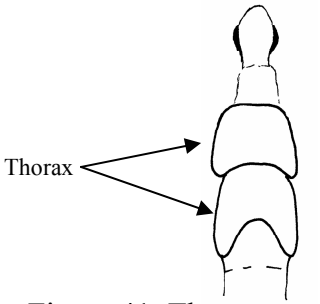

Figure 41. Thorax slender and rounded

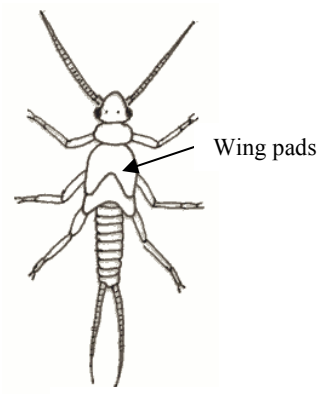

Figure 42. Wing pads divergent

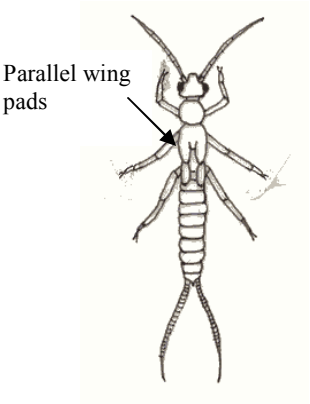

Figure 43. Wing pads parallel, Family Capniidae

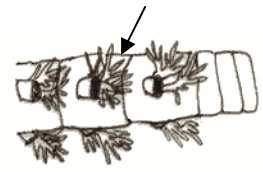

Figure 44. Gill tuffs on thorax only, Family Perlidae

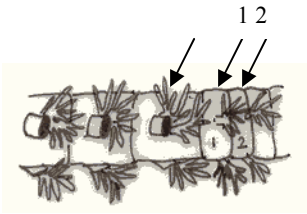

Figure 45. Gill tuffs on thorax and first and second abdominal segments, Family Pteronarcyidae

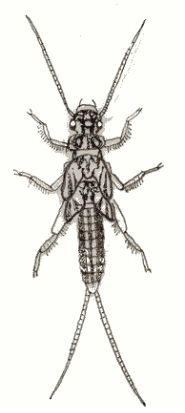

Figure 46. Distinctive color patterns, Family Perlodidae

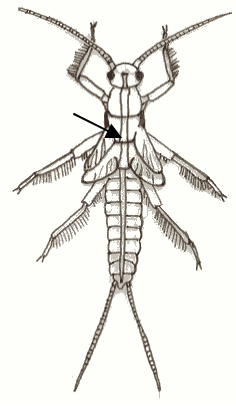

Figure 47. Pale strip on thorax and abdomen, Family Taeniopterygidae

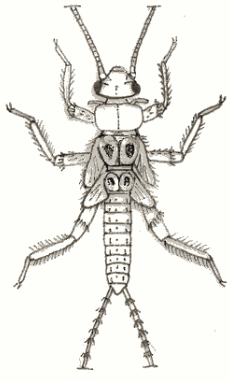

Figure 48. Family Nemouridae

Key to the Families of Odonata (Dragonflies & Damselflies)

1. Slender body, head wider than thorax and abdomen, three long featherlike gills at end of abdomen (often oar shaped), commonly called "damselfly" (Figure 49)……..…. Go to 2

   Stout body, head usually narrower than thorax and abdomen, five short extensions at tip of abdomen, commonly called "dragonfly" (Figure 50)….....Go to 3

2. First segment of **antennae** (closest to head) very long, usually as long as the rest of the segments combined (Figure 51)……...……**Calopterygidae** (*broad-winged damselfly*)

   First segment of antennae (closest to head) same size as the rest of antennae segments (Figure 52)……....**Coenagrionidae** (*narrow-winged damselfly*)

3. The end segment (bottom) of the "lower lip" (**labium**) spoon-shaped and large (Figure 53)…. ……..….**Corduliidae** or **Libellulidae** (*skimmer, emerald, green-eye, or cruiser dragonfly*)

   The end segment of the "lower lip" flat (Figure 54)……..……..Go to 4

4. Antennae have four segments and are small and **club-like** (Figure 55)…….. .....**Gomphidae** (*club-tail dragonfly*)

   Antennae have six or seven segments, not club-like……...**Aeshnidae** (*darner dragonfly*)

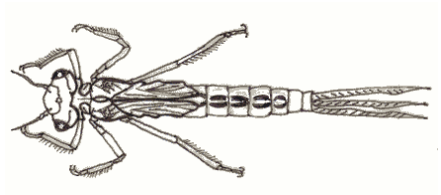

Figure 49. Damselfly larvae

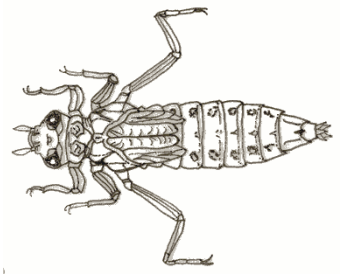

Figure 50. Dragonfly larvae

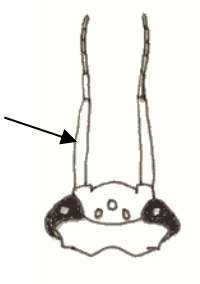

Figure 51. First antennae segment long, Family Calopterygidae

Figure 52. Equal antennae segments, Family Coenagrionidae

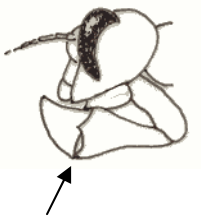

Figure 53. Spoon-shaped lower lip, Families Corduliidae or Libellulidae

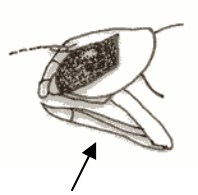

Figure 54. Lower lip flat

Figure 55. Club-like antennae with four segments, Family Gomphidae

Key to the Families of Megaloptera (Alderflies and Dobsonflies)

1. Last abdominal segment has single, long "tail"(Figure 56)…….....…..**Sialidae** (*alderfly*)

   Last abdominal segment has two hooked "tails" (Figure 57).....**Corydalidae** (*dobsonfly*)

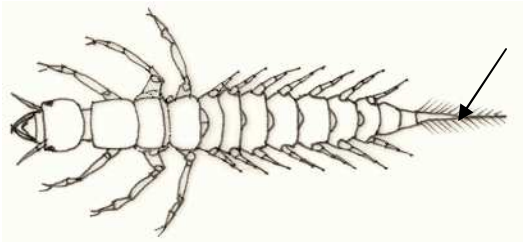

Figure 56. Long single tail, Family Sialidae

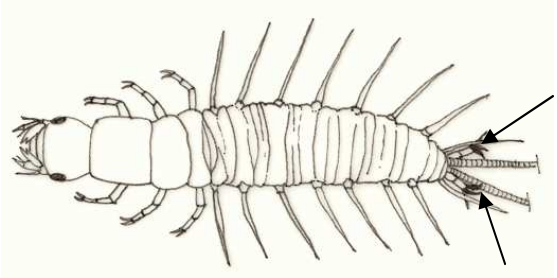

Figure 57. Two hooked tails, Family Corydalidae

Key to the Families of Trichoptera* (Caddisflies)

1. Larvae in coiled spiral **case** of small sand or pebbles resembling a snail shell (Figure 58)……. ……...…**Helicopsychidae** (*snail case-maker caddisfly*)

   Not as above……..…….…..Go to 2

2. Top of each segment of the thorax covered with a plate (Figures 59-60)……..…..Go to 3

   Top of last segment of the thorax (closest to abdomen) soft or with only small hard areas, not a plate (Figure 61)……...……...…Go to 4

3. Abdomen has rows of gills, no **portable case** (Figure 59)…….. ……..…**Hydropsychidae** (*net-spinner caddisfly*)

   Abdomen without gills (Figure 60), portable case made of sand, silk or algae (Figure 62), very small, abdomen usually enlarged or swollen (Figure 60)……. ……..…….**Hydroptilidae** (*micro caddisfly*)

4. Top of middle segment of thorax soft or with only small hard areas (plates), partially covering middle thorax segment not full plates (Figure 63) …….…….…...Go to 5

   Top of middle segment of thorax mostly covered by plates (Figures 64 and 68)……Go to 7

5. Top of last abdominal segment (at tail end) has a plate, larvae in a tortoise-shaped case made of small rocks which they leave when disturbed (Figure 65), found only in coldwater streams and springs of Northeast Iowa……**Glossosomatidae** (*saddle case-maker caddisfly*)

   Top of last abdominal segment has no plate, not as above……...…Go to 6

6. Head entirely the same color, no patterns, **mouth extension** soft, white, and T-shaped (Figure 66)…… ……..**Philopotamidae** (*finger-net caddisfly*)

   Head has dark dots or blotches, mouth extension plated and widest near the head, not T-shaped (Figure 67)……..…**Polycentropodidae** (*tube-making caddisfly*)

7. Top of middle segment of the thorax covered by weak and sometimes separated plates (Figure 68), plates may have dark curved bars (Figure 69), cases are usually narrow and tapered (Figure 70)…..……..…….**Leptoceridae**

   Top of middle segment of the thorax covered by usually two or four adjoining heavy plates (Figure 64)……..……..……...…Go to 8

8. First abdominal segment (closest to thorax) has no **noticeable bumps**, case is narrow, square or round, and may be banded due to varying shades of vegetation it is made of (Figure 71)….. ……..…….……**Brachycentridae** (*humpless case-maker caddisfly*)

   First abdominal segment (closest to thorax) has noticeable bumps, case usually not banded (Figure 72)…..……..……..**Limnephilidae**

Order Trichoptera*

*Note – Additional help in identifying the families of Tricohoptera can be found in the identification key Guide to Aquatic Invertebrates of the Upper Midwest by R.W. Bouchard, Jr. It is recommended that you use the IOWATER Benthic Macroinvertebrate Key first and the Upper Midwest guide only when additional help is needed.

Figure 58. Spiral case, Family Helicopsychidae

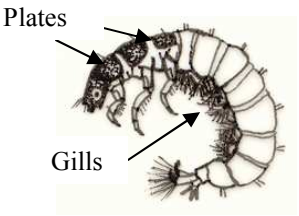

Figure 59. Family Hydropsychidae

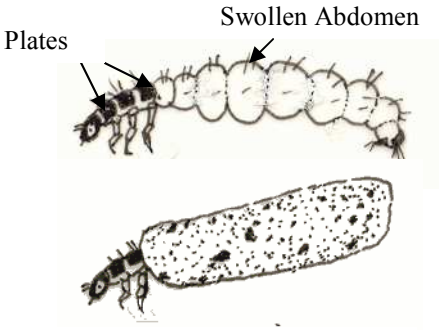

Figure 60. Family Hydroptilidae

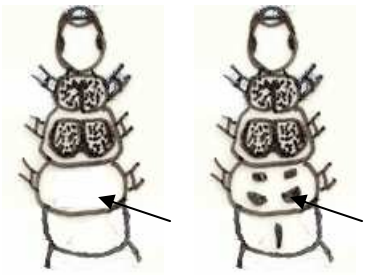

Figure 61. No plates or only small plates last segment of the thorax

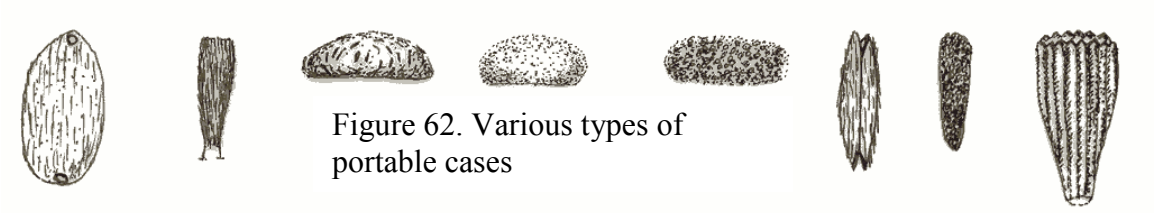

Figure 62. Various types of portable cases

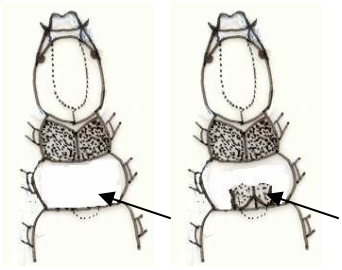

Figure 63. No plates or only small plates on middle thorax segment

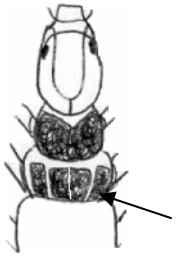

Figure 64. Middle thorax segment covered with adjoining plates

Order Trichoptera*

Figure 65. Rock case, Family Glossosomatidae

Figure 66. Mouth extension, Family Philopotamidae

Figure 67. Dotted head, Family Polycentropodidae

Figure 68. Weak plates covering middle thorax segment, Family Leptoceridae

Figure 69. Plates with dark curved bars, Family Leptoceridae

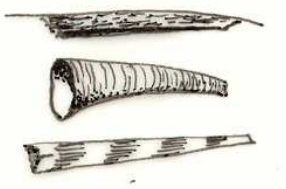

Figure 70. Narrow and tapered cases

Figure 71. Banded case, Family Brachycentridae

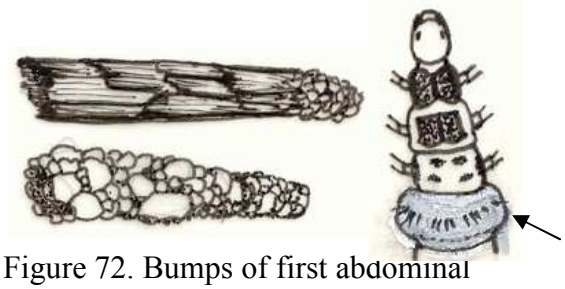

Figure 72. Bumps of first abdominal segment, rock case, Family Limnephilidae

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Key to the Adult Families of Coleoptera (Beetles)

1. On the underside of body, large plates cover base of **hind legs** (Figure 73)…… ……..**Haliplidae** (*crawling water beetle*)

   Not as above……..…….……..Go to 2

2. Two pair of eyes, one pair on top and one pair on bottom of head (Figure 74)……... ……..…..**Gyrinidae** (*whirligig beetle*)

   Head has only one pair of **undivided eyes**……...……...….Go to 3

3. Front of head has a distinct downward pointing snout (Figure 75)…...**Curculionidae** (*weevil*)

   Not as above…….…….……...Go to 4

4. Body is **streamlined**, hind legs have swimming hairs (Figure 76-77)……..…..Go to 5

   Body is not very streamlined, no swimming hairs on hind legs (Figures 79- 80)……...Go to 6

5. Short, club-shaped antenna (Figure 81)…….… **Hydrophilidae** (*water scavenger beetle*)

   Longer antenna, not club-shaped (Figure 82)…… **Dytiscidae** (*predaceous diving beetle*)

6. Club-shaped antenna has a **cuplike segment** at the base of club (in the middle of antenna) (Figure 78)….....**Hydrophilidae** (*water scavenger beetle*)

   Antenna in various forms but never with a cup-like segment at base of a club (Figures 81-83, Not Figure 78) ……..…….Go to 7

7. Antenna with **comb-like club** (Figure 83)……...**Dryopidae** (*long toed or riffle beetle*)

   Antenna in various forms but if club-shaped it is not a comb-like club (Figure 81-82, Not Figure 83) ……..……...…….....**Elmidae** (*riffle beetle*)

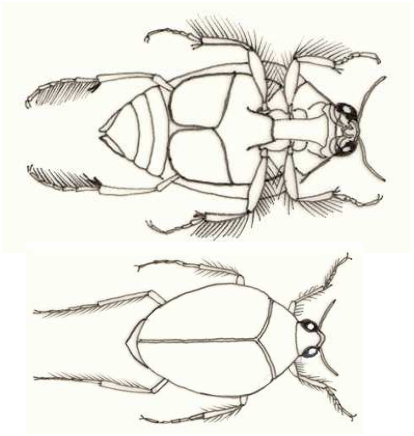


Figure 73. Plates covering base of hind legs, Family Haliplidae

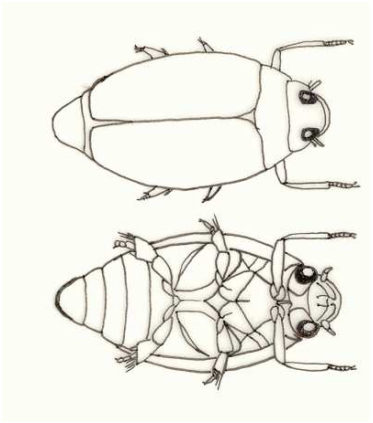


Figure 74. Two pairs of eyes, Family Gyrinidae

Adults of the Order Coleoptera

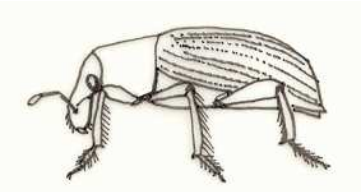


Figure 75. Downward snout, Family Curculiondiae

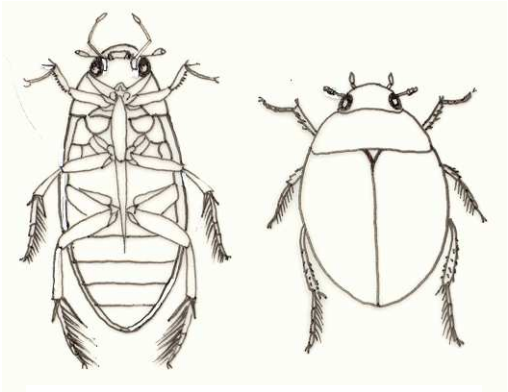


Figure 76. Streamlined body, swimming hairs on hind legs, Family Hydrophilidae

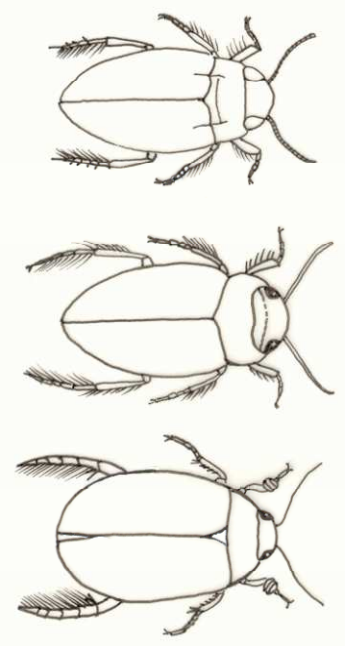


Figure 77. Streamlined body, swimming hairs on hind legs, Family Dytiscidae

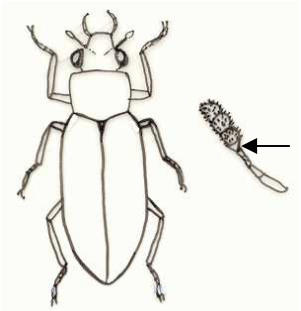


Figure 78. Non-streamlined body, no swimming hairs, cuplike segment at base of antenna club, Family Hydrophilidae

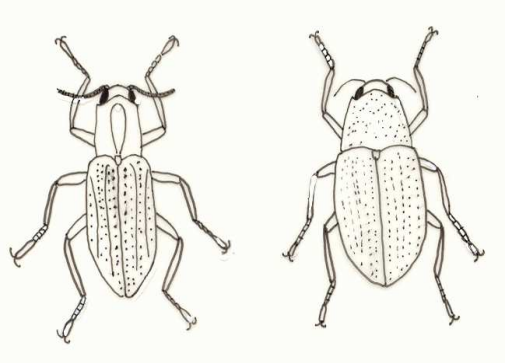


Figure 79. Non-streamlined body, no swimming hairs of Dryopidae

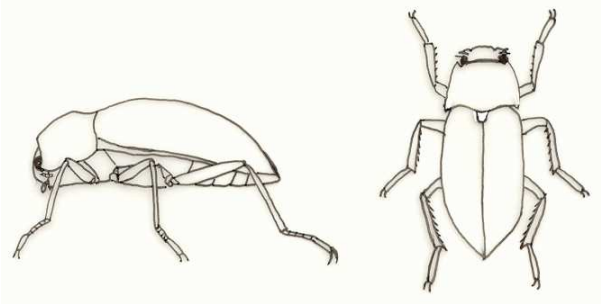


Figure 80. Non-streamlined body, no swimming hairs, Family Elmidae

Figure 81. Club-shaped antenna, Family Hydrophilidae

Figure 82. Long, pointed, not club-shaped antenna

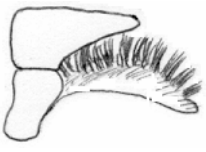


Figure 83. Comb-like club antenna, Family Dryopidae

Key to the Larval Families of Coleoptera (Beetles)

*Note – Additional help in identifying the larval families of Coleoptera can be found in the identification key Guide to Aquatic Invertebrates of the Upper Midwest by R.W. Bouchard, Jr. It is recommended that you use the IOWATER Benthic Macroinvertebrate Key first and the Upper Midwest guide only when additional help is needed.

1. Body **disc-like** with plates covering head and legs (Figure 84……**Psephenidae** (*water penny*)
   Not as above……..…….……..Go to 2

2. Legs have six segments, including claw (Figure 85)……..……..…Go to 3
   Legs have five segments, including claw (Figure 86)……..…..…..Go to 5

3. Abdomen has eight segments (Figure 87)……..….**Dytiscidae** (*predaceous diving beetle*)
   Abdomen has nine or ten segments (Figure 88-89)…….……..……...Go to 4

4. Claws double (Figure 88)……. ……..... …**Gyrinidae** (*whirligig beetle*)
   Claws single (Figure 89)……. ……..… …..**Haliplidae** (*crawling water beetle*)

5. Abdomen has eight segments, usually soft body (Figure 91-92)……..…..…..Go to 6
   Abdomen has nine segments, usually hard body (Figure 90)…….....**Elemidae** (*riffle beetle*)

6. Antenna very long (Figure 91)……..… **Scirtidae** (*marsh beetle*)
   Antenna shorter (Figure 92)……**Hydrophilidae** (*water scavenger beetle*)

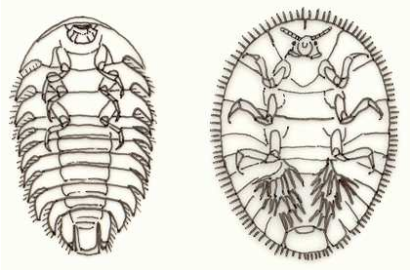


Figure 84. Disc-like body, Family Psephenidae

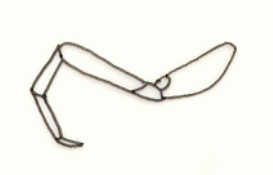


Figure 85. Six segments on legs

Figure 86. Five segments on legs

Larvae of the Order Coleoptera

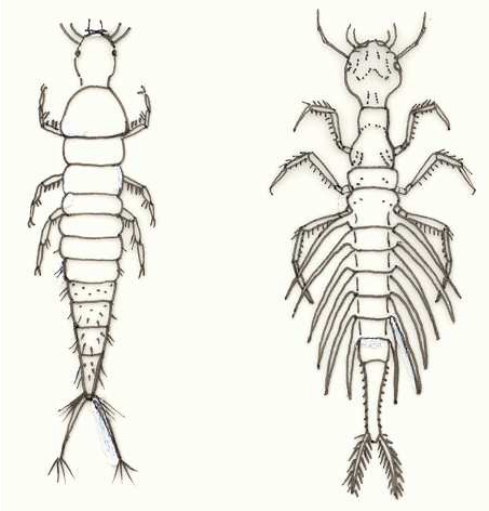


Figure 87. Eight segmented abdomen of the Family Dytiscidae

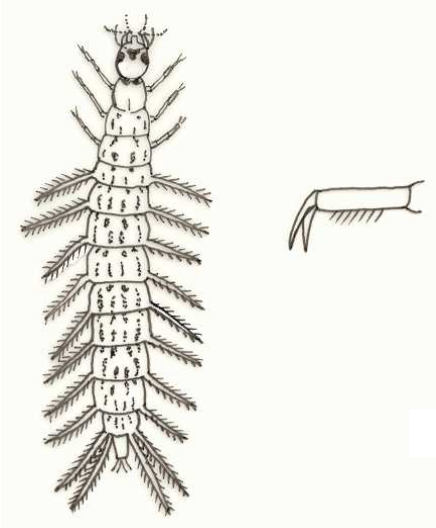


Figure 88. Double claw of the Family Gyrinidae

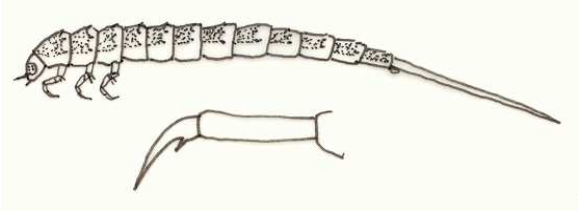


Figure 89. Single claw of the Family Haliplidae

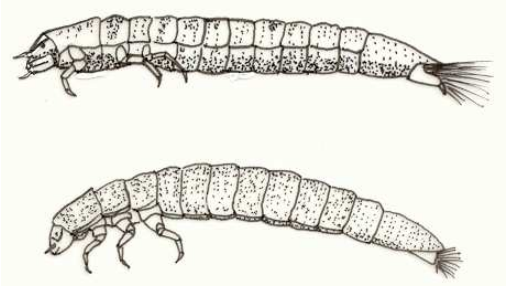


Figure 90. Abdomen with nine segments, hard body, Family Elemidae

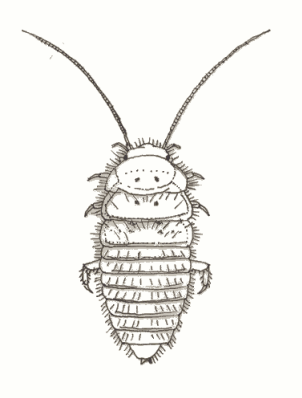


Figure 91. Very long antenna of the Family Scirtidae

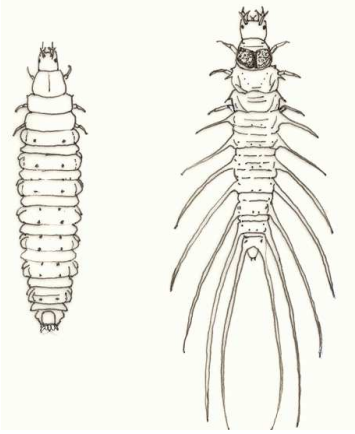
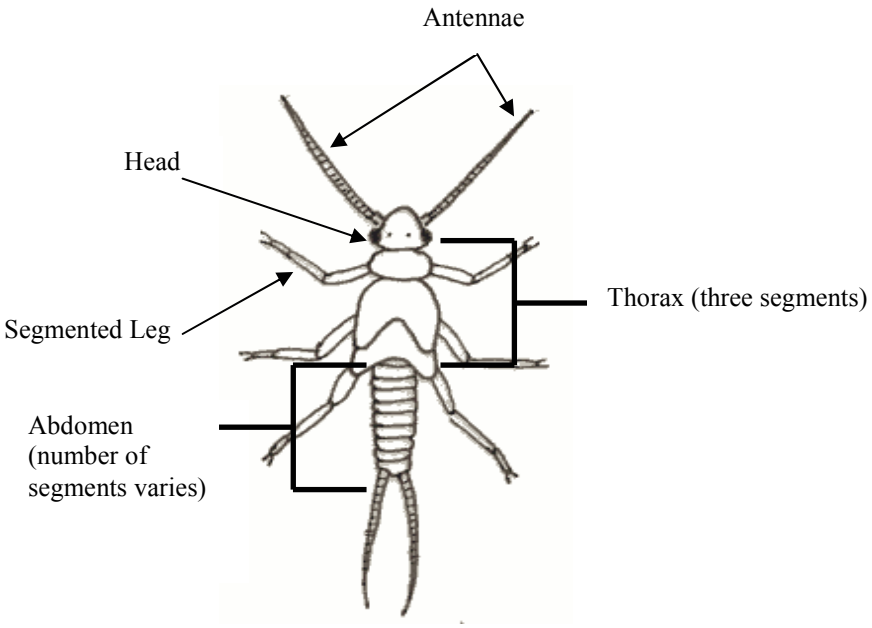


Figure 92. Short antenna of the Family Hydrophilidae

Diagram of Insect Body Parts



Glossary

Abdomen - the posterior section of the body behind the thorax

Abdominal segment - one of the parts of the abdomen that is divided or marked off by natural boundaries

Amphipoda – the class that scuds or "freshwater shrimp" are a member of

Antennae - one of a pair of slender movable sensory organs on the head of insects and crustaceans

Beetle - any of an order (Coleoptera) of insects having four wings of which the outer pair are modified into stiff plates that protect the inner pair when at rest

Benthic - describes all things associated with the bottom, or substrate of a stream

Benthic Macroinvertebrates - Bottom-dwelling organisms that lack a backbone, inhabit streams or lakes, and can be seen with the naked eye.

Biramous – a condition of appendages branching into two forks

Breathing tube – a structure extending from the body used to breath while underwater

Case - an outer covering or housing

Cephalothorax – a body segment containing a joined thorax and head

Chitin – a tough, protective, semitransparent substance, primarily a nitrogen-containing protein, forming the principal component of arthropod exoskeletons and the cell walls of certain fungi

Clam/mussel - the common name for a number of species of bivalve mollusks

Class - a major category in biological taxonomy ranking above the order and below the phylum or division

Claw - any of various sharp curved appendages especially at the end of a limb

Club-like - a heavy, usually tapering appendage

Comb-like club – pectinate, a heavy usually tapering appendage shaped like a toothed instrument used especially for adjusting, cleaning, or confining hair

Crustacean – animals of the Subphylum Crustacea; have no discernible metamorphosis; two pairs of antennae; have an exoskeleton composed of chitin; have specialized segmented

appendages; the thorax or cephalothorax has five to eight appendages; the abdomen has six pairs of appendages; appendages are usually biramous

Cuplike segment – cupule, a part of the body that is divided or marked off by natural boundaries that resemble a cup

Decapoda – the class that crayfish are a member of

Disc-like – a body part shaped like a thin circular object

Divergent - differing from each other or from a norm

Exoskeleton - an external supportive covering of an animal

Family - a group of related plants or animals forming a category ranking above a genus and below an order

Filament - a single thread or a thin flexible threadlike object, process, or appendage

Filamentous – having multiple filaments

Flatworm – animals of the Class Turbellaria; free-living; do not undergo metamorphosis with soft, elongate, flattened body; unsegmented; head resembles a triangle and has no appendages

Fleshy lobes – appendages or objects resembling flesh

Foreleg - a front leg

Forked and fringed – an appendage divided into two or more branches and bordered with short straight or twisted filaments

Gill - an organ for obtaining oxygen from water

Head capsule - a membrane or sac enclosing the head may be protected by hard plates

Hind leg – a rear leg

Hirudinea – the class that leeches are a member of

Immature larval – the early form of an animal that at hatching is unlike the adult form and must metamorphose before assuming the adult characters

Insect - any of a class of arthropods with well-defined head, thorax, and abdomen, only three pairs of legs, and typically one or two pairs of wings

Isopoda – the class that sowbugs are a member of

Key out – using this document to obtain an explanation or identification of an organism

Labium - the lower lip of an insect

Lateral filament - a single thread or a thin flexible threadlike object, process, or appendage situated on, directed toward, or coming from the side

Laterally compressed - to reduce in size or volume as if by squeezing so that the organism or body part is wider than it is tall

Left spiral snail – the most common snail type found in Iowa; opening of the shell is toward the left when viewed with the tip of the shell pointing up; a pollution tolerant group

Macroinvertebrate – an animal large enough to see that does not have a backbone

Minnow-like – describing a body shape where the head is larger than the body and the tail moves in a way to resemble the tail fin of a fish

Mollusk – animals of the Phylum Mollusca, snails, clams and mussels, have a hard shell which the body can be enclosed in

Mouth extension - a section forming an additional length to the natural opening through which food passes into the body of an animal

Noticeable bump - relatively abrupt swelling of tissue on a surface

Nymph stage - a larva of an insect with incomplete metamorphosis that differs from the adult especially in size and in its incompletely developed wings and genitalia

Oligochaeta – the class that aquatic earthworms are a member of

Order - a category of taxonomic classification ranking above the family and below the class

Phylum - one of the primary divisions of the animal kingdom

Physidae – the family that left spiral snails are a member of

Plate - a lamina or plaque that forms an armor of such on a part of an animal body

Portable case - an outer covering or housing capable of being carried or moved about

Proleg - a fleshy leg that occurs on an abdominal segment of some insect larvae but not in the adult

Pseudopod – a soft appendage that looks like and may serve as a foot

Right spiral snail – a type of pollution sensitive snail, opening of shell is facing the right when viewed with the tip of the shell pointing up

Segmented – divided or marked off by natural boundaries

Segmented leg – a leg that is divided or marked off by natural boundaries

Spine – sharp, rigid, thorn-like extension on an animal

Streamlined - contoured to reduce resistance to motion through a fluid

Sucker – a mouth that various animals have for adhering or holding

Suction pad – an organ on a leech used for adhering or holding

Tarsal claw – a sharp, curved, cartilage appendage on the 1st pair of legs on a crustacean

Thorax - the second or middle region of the body, between the head and the abdomen, in insects bearing the true legs and wings

True bug – insects of the order Hemiptera, these insects are mostly predators, swim with oar-like hind legs or can walk on water by surface tension, usually breath by the means of an air store, and have prominent eyes

True leg – one of the rather generalized segmental appendages of an insect used in walking and crawling

Tuft - a small cluster of filaments attached or close together at the base and free at the opposite ends

Tubellaria – the class that flatworms are a member of

Tusk - an elongated greatly enlarged tooth (in this context a cartilage-like substance) that projects from the head and serves for digging food or as a weapon

Undivided eyes - an eye typical of crustaceans, insects, centipedes, and horseshoe crabs, constructed of many functionally independent photoreceptor units separated by pigment cells

Unsegmented – a body part not divided by natural boundaries

Wing pads – a developing wing and its encasement

Worms - the common name for members of the Annelid phylum that are elongated, naked, soft-bodied animals resembling an earthworm